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OPERATION IN THE BAND 535-1600 kHz WITHOUT AN INDIVIDUAL LICENSE

1.0 INTRODUCTION

1.1 General The band 535-1600 kHz is allocated for broadcast stations. However, under the provisions of Part 15 of the Commission's Rules, a Low Power Communication Device or a Carrier Current System may be operated in this band without an individual license provided the operation meets all of the following conditions.

--No harmful interference is caused to any licensed operation.

--Any interference that is received must be accepted.

--The technical and other requirements of Part 15 are met.

1.2 Harmful Interference Harmful interference is defined by the Commission as any emission, radiation, or induction which endangers a radionavigation or a safety service, or which seriously degrades, obstructs, or repeatedly interrupts other licensed radio services. Since this discussion deals with operation in the AM band (535-1600 kHz), the operator must take particular care to protect the broadcast service. See Information Bulletin No. 17-G for a more detailed discussion of the interference problem.

The technical specifications imposed by Part 15 are purposely designed to limit the coverage that may be obtained in order to protect the broadcast service. Consequently, one should not expect to obtain radio coverage beyond about 300 feet. In fact, coverage beyond 300 feet is usually an indication that the operation does not conform to these limits and violates the Part 15 Rules. Requests for permission to operate outside these limits will not be granted because relaxing these technical limits to permit extended coverage, greatly increases the interference potential to the broadcast service and cannot be permitted.

2.0 LOW POWER COMMUNICATIONS DEVICES

To emit radio waves, a miniature transmitter called a LOW POWER COMMUNICATION DEVICE is connected to a small antenna. This type of device may radiate RF energy to an AM receiver over a frequency range which includes the standard AM Broadcast Band (535-1600 kHz). Sections 15.202 and 15.204 of our Rules regulate such operations.

> §15.202 Radiation limitation below 1600 kHz.
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> A low power communication device which operates on any frequency between 10 and 490 kHz or between 510 and 1600 kHz shall limit the radiation so that the field strength does not exceed the value specified in the following table:

Frequency (kHz)	Distance (feet)	Field strength (uV/m)
10-490	1,000	$\frac{2400}{F\ (\text{kHz})}$
510-1600	100	$\frac{24000}{F(\text{kHz})}$

This regulation permits operation without regard to power or antenna length provided the output signal does not exceed the field strength determined by the formula given in the regulation. A person who does not have enough technical knowledge to understand this formula should operate under the alternative requirement given below.

> §15.204 Alternative requirement for operation on frequencies between 510 and 1600 kHz.
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> In lieu of meeting the radiation limitation stated

in §15.202, a low power communication device operating on a frequency between 510 and 1600 kHz inclusive need only meet the following requirements:

(a) The power input to the final radio stage (exclusive of filament or heater power) does not exceed 100 milliwatts.

(b) The emissions below 510 kHz or above 1600 kHz are suppressed 20 dB or more below the unmodulated carrier.

(c) The total length of the transmission line plus the antenna does not exceed 10 feet.

(d) Low power communication devices obtaining their power from the lines of public utility systems shall limit the radio frequency voltage appearing on each power line to 200 microvolts or less on any frequency from 510 kHz to 1600 kHz. Measurements shall be made from each power line to grounded and with the equipment ungrounded.

This regulation provides an alternative requirement for operation in the AM broadcast band based on power and antenna length. It imposes a limit of 100 milliwatts on the power input. The antenna must not be longer than 10 feet which includes the length of the antenna proper plus the length of the transmission line plus the length of the ground lead, if used. The rules also require that any RF energy emitted by the device on frequencies below 510 kHz or above 1600 kHz be suppressed at least 20 dB below the unmodulated carrier. Finally, the rules impose a special requirement on transmitters that get their power from the regular AC power. This special requirement is that the RF energy fed back into the power lines must not be greater than 200 microvolts when measured from either side of the line to ground with the transmitter grounded and also when it is not grounded.

However whichever set of technical specifications is used, the operator may not cause harmful interference and must immediately stop operating when notified that he is causing harmful interference.

3.0 CARRIER CURRENT SYSTEMS

The second type of operation permitted by Part 15 is described as carrier current operation. In this form of operation (typically used for campus radio systems), the transmitter output is coupled into the AC power network in the building. The RF energy is carried along the wires to every AM receiver that is plugged into this network. Usually, the RF energy does not go beyond the power transformer. Because some of the RF energy leaks off the wires, receivers in the building that are near the wires will also pick up the signals. Section 15.7 of our rules provides for this type of operation.

> §15.7 General requirement for restricted radiation devices.
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> Unless regulated under some other subpart of this part, any apparatus which generates a radio frequency electromagnetic field functionally utilizing a small part of such field in the operation of associated apparatus not physically connected thereto and at a distance not greater than 157,000/F (kHz) feet (equivalent to $\lambda/2\pi$) need not be licensed provided:
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> (a) That such apparatus shall be operated with the minimum power possible to accomplish the desired purpose.
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> (b) That the best engineering principles shall be utilized in the generation of radio frequency currents so as to guard against interference to established radio services, particularly on the fundamental and harmonic frequencies.
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> (c) That in any event the total electromagnetic field produced at any point a distance of 157,000/F(kHz) feet (equivalent to λ-$2/\pi$) from the apparatus shall not exceed 15 microvolts per meter.
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> (d) That the apparatus shall conform to such engineering standards as may from time to time be promulgated by the Commission.
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> (e) That in the event harmful interference is caused, the operator of the apparatus shall promptly take steps to eliminate the harmful interference.
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> NOTE: Radio receivers, community antenna television systems, and low power communication devices are regulated elsewhere in Part 15 and are not regulated by this section.

The rules impose a limit on the amount of RF energy that the system is permitted to emit. This limit is 15 microvolts per meter (uV/m) at a distance of $\lambda/2\pi$, where λ is the wave length of the frequency that is used. This distance in feet is equal to 157,000 divided by the frequency in kHz. The 15 uV/m limit must not be exceeded when measured at the specified distance from the transmitter or from any part of the wire network carrying the RF energy.

4.0 CERTIFICATION

The FCC requires that a Low Power Communication Device be certificated to show that it has been tested and found to comply with the technical specifications in Part 15. The operator should make sure that his transmitter carries this certification label. In addition the operator should check his equipment from time to time to make sure that it continues to comply with these requirements.

Carrier Current Systems are not required to be certificated at present. However, in order to be sure that his operation continues to comply with the FCC requirements, the operator should make regular surveys--measurements of field strength around the installation--and keep the results of these surveys on file.

The certification procedure and labeling requirements are set out in Sections 15.227 & 15.228; at present there is no requirement to submit the certification information to the Commission.

> §15.227 Certification requirements.
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> (a) Except for telemetering devices and wireless microphones which have been type approved pursuant to §15.235, no low power communication device manufactured after the dates set forth in §15.229 shall be operated without a station license unless it has been certificated to demonstrate compliance with the requirements in this part.
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> (b) The owner or operator need not certificate his own low power communication device, if it has been certificated by the manufacturer or distributor.
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> (c) Where certification is based on measurement of a prototype, a sufficient number of units shall be tested to assure that all production

units comply with the technical requirements of this subpart.

(d) The certificate may be executed by a technician skilled in making and interpreting the measurements that are required to assure compliance with the requirements of this part.

(e) The certificate shall contain the following information:

(1) The operating conditions under which the device is intended to be used.

(2) The antenna to be used with the device.

(3) A statement certifying that the device can be expected to comply with the requirements of this subpart under the operating conditions specified in the certificated.

(4) The month and year in which the device was manufactured.

§15.228 Location of certificate.

The certificate shall be permanently attached to the device and shall be readily visible for inspection.

5.0 CONDITIONS OF OPERATION

A LOW POWER COMMUNICATIONS DEVICE and CARRIER CURRENT SYSTEM are restricted radiation devices. These equipments must meet the applicable technical standards specified in Sections 15.7, 15.202 or 15.204. In addition, the following rules set out general conditions governing the operation of these equipments.

§15.3 General condition of operation.

Persons operating restricted or incidental radiation devices shall not be deemed to have any vested or recognizable right to the continued use of any given frequency, by virtue of prior registration or certification of equipment. Operation of these devices is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by

> other incidental or restricted radiation devices, industrial, scientific or medical equipment, or from any authorized radio service.
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> §15.5 Equipment available for inspection.
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> Any equipment or device subject to the provisions of this part together with any license, certificate, notice of registration or any technical data required to be kept on file by the operator of the device shall be made available for inspection by Commission representatives upon reasonable request.
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> §15.11 Prohibition against eavesdropping.
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> (a) No person shall use, either directly or indirectly, a device operated pursuant to the provisions of this part for the purpose of overhearing or recording the private conversations of others unless such use is authorized by all of the parties engaging in the conversation.
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> (b) Paragraph (a) of this section shall not apply to operations of any law enforcement officers conducted under lawful authority.
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> §15.221 Class B emission prohibited.
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> Operation of low power communication devices that produce Class B emissions (damped waves) is prohibited.
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> §15.222 Interference from low power communication devices.
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> Notwithstanding the other requirements of this part, the operator of a low power communication device, regardless of date of manufacture, which causes harmful interference to an authorized radio service, shall promptly stop operating the device until the harmful interference has been eliminated.

Interference from carrier current systems is governed by §15.7(e) which requires that the operator promptly take steps to eliminate such interference.

6.0 FREQUENCY SELECTION

The FCC does not designate the specific frequency to be used by a low power communication device. The operator of the device may select his own frequency in the band 535-1600 kHz. The operator must make sure however, that his selection of an operating frequency will not result in harmful interference to persons trying to receive broadcast signals.

7.0 OPERATOR REQUIREMENTS

There are no requirements as to age, sex, citizenship, etc. No operator license is required, but the operator is expected to be acquainted with the Part 15 rules applicable to his equipment.

8.0 PERMISSIBLE TRANSMISSIONS

As a general rule, the FCC does not concern itself with the type of material transmitted over a low power communication device or a carrier current system. However, the operator is cautioned that the transmission of obscene, indecent, or profane language is prohibited by Federal law and is punished by fine, or imprisonment, or both. (See NOTE below).

The operator of a low power communication device is also warned not to rebroadcast any program of a licensed broadcast station without the written permission of the originating station. (See NOTE below).

> NOTE: On April 9, 1971, a Notice of Inquiry and Proposed Rule Making was issued (Docket No. 19092). This proceeding is investigating the need to impose specific requirements regarding the program material being transmitted. This proceeding is presently under consideration and it is not possible to indicate when or what kind of final rules may be adopted.

9.0 CALL SIGN

The FCC does not assign nor will it register call signs for the operator of a low power communication device. Any identification may be used provided it will not be confused with the call sign used by a licensed station.

10.0 HOURS OF OPERATION

The operator may select his own hours of operation.

11.0 SOURCES OF TECHNICAL INFORMATION

Information about the construction and operation of a low power communication device is published from time to time in the various popular technical journals. Files of these magazines are usually available in your local library. Information may also be found in the various technical hand books and guides found in most radio supply shops.

12.0 LICENSED OPERATION

The FCC will not issue a license for the operation of a low power station. Operation of a licensed broadcast station is a serious undertaking and a person applying for a license undertakes a commitment to provide a regular service meeting many requirements which are discussed in the bulletins listed below. Not only does the construction of a licensed station involve a substantial financial investment, but it also requires considerable legal and technical qualifications. Information on licensing will be found in: Information Bulletin 1-B; How to Apply for a Broadcast Station. Information Bulletin 21-B; Educational Radio.

13.0 OPERATION PROHIBITED IN FM BAND.

Due to the physical laws of radio propagation on frequencies in the AM band, operation with low power and a small antenna is inherently short range. Thus, it is possible to set up operating conditions in the AM band that will protect the broadcast service and still provide a reasonable operating range for the owner of a low power communication device.

This cannot be done in the FM band (88-108 MHz). Conditions in this band are completely different and long range transmission is possible even with extremely low power — a fact that is well known and well documented. In the face of this physical phenomenon, the Commission has not found it possible to set up operating conditions on the FM band that would provide a reasonable operating range. Accordingly, operation without an individual license for low power broadcasting in the FM band is strictly prohibited.

For a discussion of radio wave propagation and transmission range of radio signals, the reader should refer to text books on the subject of radio available in libraries. Index search under the term radio wave propagation should lead to the desired information.

14.0 DEFINITIONS

The following terms used in this Bulletin have been defined by the Commission and their definitions are listed below.

> §15.4 General definitions.
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> (b) Harmful interference. Any emission, radiation or induction which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a radiocommunication service operating in accordance with this chapter.

* * * * *

(d) Restricted radiation device. A device in which the generation of radio frequency energy is intentionally incorporated into the design and in which the radio frequency energy is conducted along wires or is radiated, exclusive of transmitters which require licensing under other parts of this chapter and exclusive of devices in which the radio frequency energy is used to produce physical chemical or biological effects in materials and which are regulated under the provisions of Part 18 of this chapter.

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(f) Low power communication device. A low power communication device is a restricted radiation device, exclusive of those employing conducted or guided radio frequency techniques, used for the transmission of signs, signals (including control signals), writing, images and sounds or intelligence of any nature by radiation of electromagnetic energy.

EXAMPLES: Wireless microphone, phonograph oscillator, radio controlled garage door opener and radio controlled models.

CAUTION

REMEMBER -- YOU MAY NOT CAUSE HARMFUL INTERFERENCE.

REMEMBER TOO -- WHEN YOU ARE NOTIFIED THAT YOUR OPERATION IS CAUSING HARMFUL INTERFERENCE, YOU MUST STOP OPERATING IMMEDIATELY.